HONORS COLLEGE ALGEBRA SUMMER ASSIGNMENT

ALGEBRA REVIEW MATERIAL

Directions:

1. *Pick up a copy of College Algebra, 8th edition by Lial, Hornsby and Schneider in B 125 during exam week (June 9 – 12), or at the PHS library after June 12.*
2. *Complete ALL work in this packet in the spaces provided. Show your work the same way that is shown in the provided examples.*
3. *Definitions and explanations should be complete and mathematically correct; use textbook pages as indicated.*
4. *Work for problems must be included. Answers alone will not be accepted.*
5. *All work should be completed WITHOUT the use of a calculator.*
6. *Students should use the following resources for assistance in reviewing Algebra 2 topics:*
    1. *College Algebra, 8th edition by Lial, Hornsby and Schneider*
    2. *https://www.khanacademy.org/*
    3. *http://www.purplemath.com/*
    4. *http://phshca.wikispaces.com/Summer+Packet*

IMPORTANT – *On approximately the tenth day of school, students will take a test that covers the topics reviewed in this packet. In the days preceding this test, students will have an opportunity to ask questions about the packet. To ensure success on this test and the units covered in the first semester of this course, students should be sure to complete this packet thoroughly and accurately.*

ALGEBRA REVIEW: Sets of Numbers

(Textbook Pages: Pages 2 – 5)

A) Define each of the following Sets of Numbers.

1) Natural Numbers (N)

2) Whole Numbers (W)

3) Integers (I)

4) Rational Numbers (Q)

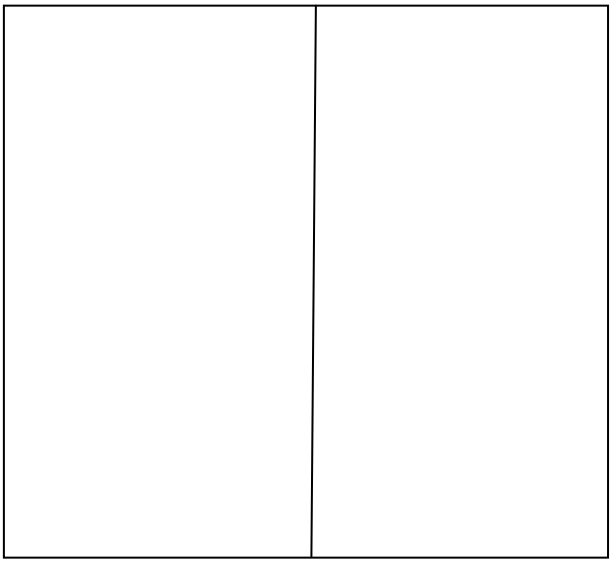
Match the various forms in which a rational number may be written to the example given:
(Mixed Number, Whole Number, Integer, Natural Number, Terminating Decimal, Repeating Decimal)

Example	Form	Example	Form	Example	Form
5		$\frac{4}{7}$		9.2111	
0					
		$7\frac{8}{11}$		$9.\overline{21}$	
–5					

5) Irrational Numbers (Ir)

6) Real Numbers (R)

B) Copy the VENN DIAGRAM of Real Numbers (Figure 6) from page 5 of the textbook:



C) State the most specific set of numbers each of the following sets represent. Use symbols not words.

_____ 1) $\left\{-3, \frac{16}{4}, -\sqrt{25}, 0, 12\right\}$

_____ 2) $\left\{-\sqrt{64},\ 7\frac{2}{5},\ -9.55,\ \frac{13}{72},\ 4.1\overline{237}, 5,\ .72\overline{3}\right\}$

_____ 3) $\left\{8, \frac{16}{4}, \sqrt{49}, 12, 3^2\right\}$

_____ 4) $\left\{-\sqrt{64},\ 7\frac{2}{5},\ 7.121121112...,\ \frac{13}{72},\ 4.1\overline{237}, \sqrt{12},\ .72\overline{3}\right\}$

_____ 5) $\left\{8, \frac{16}{4}, 0, \sqrt{49}, 12, 3^2\right\}$

_____ 6) $\left\{\sqrt{12},\ 7.121121112...,\ \frac{7\pi}{4}\right\}$

D) Exercises: page 12 #1 – 14

1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____

7.

8.

9. 10.

11. 12.

13. 14.

ALGEBRA REVIEW: Properties of Real Numbers

(Textbook Pages: Pages 8 – 11)

A) Complete the equation to illustrate the following Properties of Real Numbers.
B) **Describe** the property with key words or phrases. **DO NOT** copy the definitions (p. 11) from the book.

1A) Closure + } $4 + 6 = 10$ *10 is a real number*
Closure x } $4 \cdot 6 = 24$ *24 is a real number*

B) *When real numbers are added or multiplied the answer is still a real number.*

2A) Commutative + } $2 \cdot (4 + 6) =$ _____
Commutative x } $2 \cdot (4 + 6) =$ _____

B)

3A) Associative + } $2 + (4 + 6) =$ _____
Associative x } $2 \cdot (4 \cdot 6) =$ _____

B)

4A) Identity + $2 \cdot (4 +$ _____$) = 2 \cdot 4$

B)

5A) Identity x $2 \cdot (4 \cdot$_____$) = 2 \cdot 4$

B)

6A) Inverse + $2 \cdot (4 +$ _____$) = 2 \cdot 0$

B)

7A) Inverse x $2 \cdot (4 \cdot$_____$) = 2 \cdot 1$

B)

8A) Distributive (x over +) $2 \cdot (4 + 6) =$ _____

B)

C) State the name of the property illustrated by each equation, be sure to include the operation.
Behind each give a reason that supports your answer (i.e. order of multiplication changed).

_____ 1) $9 + (\sqrt{5} + 0) = 9 + (0 + \sqrt{5})$ _____

_____ 2) $2 + 7\left(\frac{2}{3} \cdot \frac{3}{2}\right) = 2 + \left(7 \cdot \frac{2}{3}\right) \cdot \frac{3}{2}$ _____

_____ 3) $2 + 7 \cdot 1 = 2 + 7$ _____

_____ 4) $6(-4 + 4) = 6(0)$ _____

_____ 5) $6(-4 + 4) = -24 + 24$ _____

_____ 6) $9 + (\sqrt{5} + 0) = 9 + \sqrt{5}$ _____

_____ 7) $2 + 7\left(\frac{2}{3} \cdot \frac{3}{2}\right) = 2 + 7 \cdot 1$ _____

D) Exercises: page 14 #51 – 66
For #63 – 66 Show work (distribution and reducing of fractions) --- DO NOT use a calculator.

51. 52.

53. 54.

55. 56.

57.

58.

59. 60.

61. 62.

63. 64.

65. 66.

Exercises: page 16 #85 – 88 (Rewrite the problem to indicate the mental math you are doing.)

85. 86.

87. 88.

ALGEBRA REVIEW: Order of Operations

(Textbook Pages: Pages 5– 7)

A) Complete the following using the order of operations. Do only **ONE STEP** at a time.
For each step, list the specific problem you are doing for that step and its answer in the first column, and then substitute that answer into the problem and state the result in the second column.
The first one is completed as an example.

1) $5 - 7 + 3^3 \div 9 \cdot (7 - 9)$

a) Problem/Answer: *$7 - 9 = -2$* Result: *$5 - 7 + 3^3 \div 9 \cdot$ **(-2)***

b) Problem/Answer: *$3^3 = 27$* Result: *$5 - 7 +$ **27** $\div 9 \cdot (-2)$*

c) Problem/Answer: *$27 \div 9 = 3$* Result: *$5 - 7 +$ **3** $\cdot (-2)$*

d) Problem/Answer: *$3 \cdot (-2) = -6$* Result: *$5 - 7 +$ **(-6)***

e) Problem/Answer: *$5 - 7 = -2$* Result: ***(-2)*** *$+ (-6)$*

f) Problem/Answer: *$(-2) + (-6) = -8$* Result: ***-8***

2) $8 + (-3^2 + 3) \div 2 \cdot 4 - 6$

	Problem/Answer	Result
a)		
b)		
c)		
d)		
e)		
f)		

3) $\left[24 \div (1-3)^2 + 3 \cdot (-2)\right]^4$

	Problem/Answer	Result
a)		
b)		
c)		
d)		
e)		
f)		

4) $\left[2 + (3-5)6\right] \div \left(5 \cdot 8 - 10\right)$

	Problem/Answer	Result
a)		
b)		
c)		

	Problem/Answer	Result
d)		
e)		
f)		

5) $12 + 25 \div (2 + 3) \cdot (4 - 5)^2$

	Problem/Answer	Result
a)	_____	_____
b)	_____	_____
c)	_____	_____
d)	_____	_____
e)	_____	_____
f)	_____	_____

6) $-2^2\left[4(8-2\cdot 3)+7\right]-2^2$

	Problem/Answer	Result
a)	_____	_____
b)	_____	_____
c)	_____	_____
d)	_____	_____
e)	_____	_____
f)	_____	_____
g)	_____	_____
h)	_____	_____

7) $\dfrac{\left(3-5\cdot 2^3+1\right)\div 9}{(5-6)^3+6\div 2}$

Numerator

	Problem/Answer	Result
a)	_____	_____
b)	_____	_____
c)	_____	_____
d)	_____	_____
e)	_____	_____

Denominator

	Problem/Answer	Result
a)	_____	_____
b)	_____	_____
c)	_____	_____
d)	_____	_____

FINAL: Problem/Answer _____

B) Exercises: page 12 #15 – 42 Show **ALL** work
For problems #15-21 show the factors you are multiplying and the solution

15. 16.

17. 18.

19. 20.

21. 22.

23. 24.

B) Exercises: page 12 #15 – 42 Show **ALL** work *(Continued)*

For problems 25-42 copy the problem and show all steps

All problems should be completed WITHOUT a calculator

Fraction work should be shown (LCD, Reducing) --- DO NOT use a calculator.

ALGEBRA REVIEW: Rules of Exponents

(Textbook Pages: Pages 25 – 27 and 53 – 55)

A) Complete the mathematical rule of exponents.
B) Complete the corresponding numerical problem.
C) **Describe** in your own words the rule of exponents.

1) PRODUCT RULE --- *Multiplying exponential expressions with the same base*

A) $a^m \cdot a^n$ = _____

B) $x^{12} \cdot x^5$ = _____

C) When you multiply exponential expressions with the same base,_____.

2) QUOTIENT RULE --- *Dividing exponential expressions with the same base*

A) $\frac{a^m}{a^n}$ $a \neq 0$ = _____

B) $\frac{x^{12}}{x^5}$ $x \neq 0$ = _____

C) When you divide exponential expressions with the same base,_____.

3) POWER RULE --- *Raising an exponential expression to a power*

A) $(a^m)^n$ = _____

B) $(x^{12})^6$ = _____

C) When you raise an exponential expression to a power,_____.

4) PRODUCT TO POWER RULE --- *Raising a product to a power*

A) $(ab)^m$ = _____

B) $(7x)^2$ = _____

C) When you raise a product to a power,_____.

5) QUOTIENT TO POWER RULE --- *Raising a quotient to a power*

A) $\left(\frac{a}{b}\right)^m$ $b \neq 0$ = _____

B) $\left(\frac{x}{3}\right)^3$ = _____

D) When you raise a quotient to a power,_____.

6) ZERO POWER RULE --- *Raising an expression to the zero power*

A) $a^0 \quad a \neq 0 \quad =$ _____

B) $7^0 =$ _____

C) Anything, except 0, to the 0 power is _____.

7) NEGATIVE EXPONENT RULE --- *Raising an expression to a negative power*

A) $a^{-m} \quad a \neq 0 \quad =$ _____

B) $x^{-12} \quad x \neq 0 \quad =$ _____

C) A negative exponent indicates _____.

8) *Adding exponential expressions with the same base* *(Hint: Do part B first)*

A) $a^m + a^n =$ _____

B) $2^2 + 2^3 =$ _____

C) The addition of exponential expressions with the same base, _____.

9) Raising a negative quantity to a power ---
Indicate the multiplication problem and the answer for each of the following

A) $(-5)^2 =$ _____ = _____

B) $(-2)^3 =$ _____ = _____

C) $-5^2 =$ _____ = _____

D) $-2^3 =$ _____ = _____

With reference to the above problems, explain the effect parentheses have when evaluating powers.

D) Exercises: Page 33 #1 – 12

1. 2. 3. 4.

5.

6.

7. 8. 9. 10.

11. 12.

ALGEBRA REVIEW: Radicals

(Textbook Pages: Pages 68 – 72)

A) Simplify the following radicals. Show the prime factorization for each radicand as indicated by the examples.

Example 1: $\sqrt{9504}$

$\sqrt{2^5 \cdot 3^3 \cdot 11}$

$. \; 2^2 \cdot 3\sqrt{2 \cdot 3 \cdot 11} \; = \; 12\sqrt{66} \, .$

Example 2: $\sqrt{3472875}$

$\sqrt{3^4 \cdot 5^3 \cdot 7^3}$

$3^2 \cdot 5 \cdot 7\sqrt{5 \cdot 7} \; = \; 315\sqrt{35}$

1. $\sqrt{1584}$
2. $\sqrt{380}$
3. $\sqrt{1452}$
4. $\sqrt{2645}$
5. $\sqrt{11907}$
6. $\sqrt{4275}$

B) Perform the indicated operations. Show all work. Do NOT use a calculator.
An example problem for each operation is given.

Addition/Subtraction Example: $\sqrt{48} \; - \; 5\sqrt{27}$

$$4\sqrt{3} - 5 \cdot 3\sqrt{3} \; = \; 4\sqrt{3} - 15\sqrt{3} = \; -11\sqrt{3}$$

1. $\sqrt{52} + \sqrt{117}$
2. $\sqrt{175} - \sqrt{252}$
3. $5\sqrt{60} + 2\sqrt{135}$
4. $2\sqrt{80} - 3\sqrt{45} + 3\sqrt{245}$

Multiplication Example: $\sqrt{12} \cdot \sqrt{54}$ *(Note: Do NOT use a calculator; Use FACTORS)*

$$\sqrt{12 \cdot 54} \; = \; \sqrt{(2^2 \cdot 3) \cdot (2 \cdot 3^3)} \; = \sqrt{2^3 \cdot 3^4} \; = \; 2 \cdot 3^2\sqrt{2} \; = \; 18\sqrt{2}$$

5. $\sqrt{72} \cdot \sqrt{42}$
6. $\sqrt{92} \cdot \sqrt{115}$
7. $\left(2\sqrt{40}\right)\left(3\sqrt{60}\right)$
8. $\sqrt{288}\left(3\sqrt{108}\right)$

Division Example: $\sqrt{\frac{5}{54}} = \frac{\sqrt{5}}{\sqrt{54}}$

NOTE:
If possible reduce before simplifying or rationalizing

$\frac{\sqrt{5}}{\sqrt{2 \cdot 3^3}}$ *Rationalize the denominat*or: $\left(\frac{\sqrt{5}}{\sqrt{2 \cdot 3^3}}\right)\frac{\sqrt{6}}{\sqrt{2 \cdot 3}}$

$\left(\frac{\sqrt{30}}{\sqrt{2^2 \cdot 3^4}}\right) = \frac{\sqrt{30}}{2 \cdot 3^2} = \frac{\sqrt{30}}{18}$

9. $\frac{\sqrt{75}}{\sqrt{28}}$

10. $\frac{3\sqrt{11}}{\sqrt{24}}$

11. $\frac{\sqrt{125}}{\sqrt{108}}$

12. $\frac{3\sqrt{90}}{2\sqrt{126}}$

ALGEBRA REVIEW: Complex Numbers

(Textbook Pages: Pages 103-110)

A) Define each of the following:

1) i

2) $\sqrt{-a}$ if $a > 0$

3) Pure imaginary Number

4) Complex Number

B) Write each of the following in standard form:

1) $\sqrt{-81}$

2) $-\sqrt{-14}$

3) $-3-\sqrt{-12}$

4) $\sqrt{-196}$

5) $\sqrt{-50}$

6) $19+\sqrt{-16}$

C) Perform the indicated operations. SHOW ALL WORK.

To add and subtract imaginary numbers first simplify each radical: then add or subtract by combining like terms.

1) $3\sqrt{-64}-2\sqrt{-36}$

2) $2\sqrt{-8}+9\sqrt{-18}$

3) $9\sqrt{-25}+\sqrt{-100}-4\sqrt{-64}$

4) $7\sqrt{-80}-6\sqrt{-20}$

When multiplying radicals with negative radicands you must first change each radical to i-form. Remember, when multiplying radical forms use the factors of the radicand rather than the actual number itself; this will make it easier to simplify the radical.

5) $\sqrt{-27}\cdot\sqrt{-60}$

6) $\sqrt{-54}\cdot\sqrt{2}$

7) $\left(3\sqrt{-5}\right)\left(-4\sqrt{-12}\right)$

8) $\sqrt{-8}\left(\sqrt{-5}-\sqrt{-6}\right)$

9) $\left(5\sqrt{-7}\right)\left(2\sqrt{14}\right)$

10) $\sqrt{-12}\left(\sqrt{-4}-\sqrt{2}\right)$

When dividing radicals, reduce first; then rationalize the denominator if necessary.

11) $\dfrac{\sqrt{-63}}{\sqrt{15}}$

12) $\dfrac{\sqrt{-90}\cdot\sqrt{-15}}{\sqrt{-25}\cdot\sqrt{-27}}$

13) $(7 - 3i) + (-4 + 7i) - (6 - 8i) =$

To add complex numbers, add _____.

14) $(5 - 3i)(2 - 4i) =$

To multiply complex numbers, _____.

15) $(7 - 6i)^2 =$

Explain the short cut for squaring a complex number.
Do not merely state the formula --- EXPLAIN IN WORDS:

E) Exercises page 109 #1-28 Complete these problems in the space provided below.

ALGEBRA REVIEW: Polynomials

(Textbook Pages: Pages 25 – 36)

A) Define each of the key terms for polynomials.

1) algebraic expression:

2) term:

3) like terms:

4) coefficient:

5) polynomial:

6) degree ---
   a. degree of a **term** containing more than one variable:

   b. degree of a **polynomial in one variable**:

   c. degree of a **polynomial in more than one variable**:

7) special classifications of polynomials:
   a. monomial:

   b. binomial:

   c. trinomial:

B) Complete the statement indicating the process used to perform the indicated polynomial operations and complete the given problem.

1) When adding and subtracting polynomials:

$(3x^2 – 2x + 3) + 4(5x^2 – 2x + 4) – (2x^2 + 6x – 7) =$

2) When multiplying polynomials:

$(3x + 5)(2x^2 – 3x + 5) =$

3) The shortcut for multiplying the sum and difference of the **same** two terms is:
(State the formula AND explain the process in words without using variables.)

$(4x^2y^3 - 9z^9)(4x^2y^3 + 9z^9) =$

4) The shortcut for squaring a binomial is:
(State the formula AND explain the process in words without using variables.)

$(4x^2y^3 - 9z^9)^2 =$

C) Exercises: Page 33 #13 – 38 Complete these problems in the space provided below.

ALGEBRA REVIEW: Factoring Polynomials

(Textbook Pages: Pages 37-44)

A) DEFINE "FACTORED COMPLETELY" ---

B) TYPES OF FACTORING

1) COMMON FACTOR

a) Multiply: $3y^3(2x^2 - 3xy + 6y^2)$ = _____
Using the distributive property and the above information,
FACTOR: $6x^2y^3 - 9xy^4 + 18y^5$ = _____

b) Describe how you will determine whether the polynomial can be factored using this method AND how you will complete the factoring.
Characteristics of polynomial:

To complete the factoring:

c) Use this process to factor completely each of the following:

1. $25a^5b^3 - 10a^3b^4 + 5a^2 b$ = _____

2. $3x^2yz^2 + 18xyz^3$ = _____

2) DIFFERENCE OF SQUARES

a) Use the special product to multiply: $(5x + 3y)(5x - 3y)$ = _____
Using this information,
FACTOR: $25x^2 - 9y^2$ = _____

b) Describe how you will determine whether the polynomial can be factored using this method AND how you will complete the factoring.
Characteristics of polynomial:

To complete the factoring: (Include how many and what type of polynomials the factors will be, as well as an explanation of how to determine each of the terms for these factors?)

c) Use this process to factor completely each of the following:

1. $121x^4 - 144y^6$ = _____

2. $1 - 81x^4$ = _____

3) SUM OR DIFFERENCE OF CUBES

a) Use the special product to multiply: $(5x + 3y)(25x^2 – 15xy + 9y^2)$ = _____
Using this information,
FACTOR: $125x^3 + 27y^3$ = _____

b) Describe how you will determine whether the polynomial can be factored using this method AND how you will complete the factoring.
Characteristics of polynomial:

To complete the factoring: (Include how many and what type of polynomials the factors will be, as well as an explanation of how to determine each of the terms for these factors?)

c) Use this process to factor completely each of the following:

1. $8x^6 – y^3$ = _____
2. $64a^9 + 216$ = _____

4) PERFECT SQUARE TRINOMIALS

a) Use the special product to multiply: $(5x – 3y)^2$ = _____
Using this information,
FACTOR: $25x^2 – 30xy + 9y^2$ = _____

b) Describe how you will determine whether the polynomial can be factored using this method AND how you will complete the factoring.
Characteristics of polynomial:

To complete the factoring: (Include how many and what type of polynomials the factors will be, as well as an explanation of how to determine each of the terms for these factors?)

c) Use this process to determine which of the following can be factored using this method; factor only those that meet the characteristics:

1. $81x^{12} – 90x^6y^8 + 25y^{16}$ = _____
2. $16x^2 – 24x – 9$ = _____
3. $36x^{10} + 84x^5y^{11} + 49y^{22}$ = _____
4. $25x^2 + 15x + 9$ = _____

5) TRINOMIALS

a) Use the special product to multiply: $(5x - 3y)(2x + 7y) =$ _____
Using this information,
FACTOR: $10x^2 + 29xy - 21y^2 =$ _____

b) Use this process to factor completely each of the following. For EACH problem, show your work or explain the process you used for determining the factors – include specific numbers. Merely checking your solution is not acceptable.

1. $8x^2 + 19x - 15 =$ _____

2. $6x^2 + 11x + 4 =$ _____

3. $6x^2 - 5x - 14 =$ _____

4. $4x^2 + 19x + 12 =$ _____

ALGEBRA REVIEW: Solving Linear Equations

(Textbook Pages: Pages 84 - 87)

A. Define the three types of equations. For each type indicate how you recognize it and what type of solution it has. Include the example and solution provided in the textbook for each.

1. Contradiction

2. Identity

3. Conditional

B. When solving linear equations:
   1. Eliminate all parentheses by distributing
   2. Eliminate all fractions and decimals by multiplying by the lowest common denominator
   3. Combine like terms
   4. Use the Addition and Multiplication Properties of Equality to isolate the variable.

C. Exercises page 89 #19 - 28
   Solve the linear equations using the steps above. Show ALL work. Do NOT use a calculator.

ARITHMETIC REVIEW

It is expected you will be able to calculate the following types of arithmetic problems WITHOUT the use of a calculator and without long division or multiplication. Show your work or explain your mental math for each problem.

1. 3,400 x 6,000

2. 2.041 x 700

3. 15,000 x .3

4. $6\overline{)4598}$

5. $.4\overline{)7743}$

6. $\frac{63}{15} \cdot \frac{36}{28} \cdot \frac{10}{18}$

7. $\frac{15}{133} \div \frac{27}{95}$

8. $24 \div 2\frac{2}{5}$

9. $19 - 2\frac{5}{9}$

10. $3 \cdot 7\frac{3}{8}$